

# Semantic Search User Interface Patterns : An Introduction

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## ABSTRACT

Within the past few years, many patterns and principles have been proposed towards the enhancement of search user interfaces and experience. However, to access and explore information efficiently is still significantly challenging. Recently, we have seen the rise of a new kind of information retrieval approach, the so-called semantic search systems. These systems promise more accurate results while exploring semantics of the data. Although there exist several search user interfaces tailored to semantic search, there is still a lack of usability studies as well as good practices. In this work, we discuss the applicability of traditional search user interfaces in semantic search systems. Furthermore, we propose a new interaction model based on four patterns: Poli-Communicative, Discrete Display, Heterogeneous Data-face and Dive in-place.

## Keywords

Semantic Search User Interface, Interaction Design, Human-Computer Interaction, Semantic Search

## 1 INTRODUCTION

Although significant efforts have been devoted to research and development of search engines, the search is not a solved problem. In fact, users still find it challenging to access and explore information. With the advent of the Internet, personal computers, mobile devices as well as Smart TVs, the amount of information generated by users is increasing day by day. More and more users resort to search engines to find the information needed. Indeed, search engines are shaping how we access and learn information. However, apart from the sophisticated algorithms behind search engines, there are other aspects as important as a good search algorithm: the user interface.

User interfaces are the gateway of the search engines, they facilitate users to find, explore, and understand the information. Since the inception of the first search engine [3], many ideas have been developed to enable and facilitate content access and exploration. Some of these ideas have become repeatable good practices to solve common problems and thereby have been established as patterns. Examples of such patterns are Faceted Search and Autocomplete.

In this work, we discuss the applicability of search patterns and propose an extension of those for semantic search interfaces. By *semantic search*, we do not restrict our view to engines that make use of RDF data, but to applications that try to understand the searcher's intent by using the contextual meaning of the terms in the query. Moreover, we extend the concept of semantics to visual aspects of the results been displayed to the user. As it is shown by many researchers [5, 8, 9], these aspects do influence the user's cognitive perception and thus should be explored. Our aim is to develop a semantic search user interface as part of the openQA framework [7]. openQA is a framework designed for fast and easy development of questions answering and semantic search approaches. The remaining of this paper is structured as follows. Section 2 discusses four patterns for semantic search that we propose. Finally, Section 3 concludes with an outlook of the future work.

## 2 A SEMANTIC SEARCH USER INTERFACE

In this section, we present and illustrate four patterns – (1) Poli-Communicative, (2) Discrete Display, (3) Heterogeneous Data-face and (4) Dive in-place – that extend the ten previously introduced patterns. Some of the proposed patterns are (partially) implemented in some of the existing semantic search applications, but they were not previously defined [8]. The four patterns are based on user experience as well as an analytical review of the literature.

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We propose that semantic search interfaces should not limit themselves to merely support Natural Language techniques such as query expansion or better understanding complex queries, but be poli-communicative. That is, displaying the information more efficiently, embracing users with cognitive difficulties as well as the many aspects of the communication process.

## 2.2 Discrete Display

Information can be more or less important for a given input query. Krug et al. [5] argue that users spend a little time reading most Web pages. Instead, *they scan them, looking for words or phrases that catch their eye*. Therefore, Krug concludes that clear visual hierarchy is *the best way to make a page easy to grasp in a hurry*. Most of the semantic search interfaces restrict the differentiation of result relevance by its position in the resulting list. However, the layout is very important for user's interaction and perception, it has to be with the organization of the data being displayed. We propose that the relevance of an information should not just affect its position, but also its style as well as the mode it is being displayed with. For instance, data with more importance should be displayed with more details and more evidence (big fonts, big boxes, big images) than other data. Google's interface provides these capabilities to some extent. For instance, when displaying the result for the query "Michael Schumacher" Google shows the required information on the right while the documents sorted by relevance are on the left side. However, the user might be looking for the result in the right, but when displaying documents on the left, Google is clearly giving more emphasis to the documents.

This design pattern clearly is inconsistent with usability studies [2, 9, 4]<sup>2</sup> that shows that user's attention follows the same read/write patterns (F-Shaped Pattern). That is, the user's attention goes descending from left to right and top to bottom. Furthermore, the documents are being displayed with the same font and emphasis. The only apparent difference is the position in the result list.

Figure 2 shows one of most emblematic examples of Discrete Display, the newspaper. The newspaper displays information accordingly with its relevance. The most relevant information occupied more space, have bigger fonts and appears on the first pages. Figure 1(a) depicts an example of (1) Discrete Display for semantic search interfaces in which the most relevant result is positioned on top with more evidence.



Figure 2: Example of Discrete Display pattern in the daily journal New York Times.



Figure 3: Layout 3. Google displaying results for 1994 F1 videos.

## 2.3 Heterogeneous Data-face

A good semantic search interface should support different data presentation. Most of the data semantic search interfaces do not take into consideration the type of data being displayed. Heterogeneous Data-face (HD) is an extension of the pattern Structured Results. The main difference is that Structured Results is about having structured data in the result page mainly focusing on user's intent, while HD is about displaying results from different data sources in the resulting page—e.g. video, audio, documents, structured information, and image. Data can have different types and properties, thereby are heterogeneous. In this sense, a good semantic search interface must support different types of data presentation. Many search interfaces already explore this concept such as Google, Yahoo, and Bing. For instance, geographic data can be displayed on a map while video can be displayed in a video canvas. However, there is still a place for improvement. One example is the result displayed in Google for the query "videos of formula one"—Figure 3—in which there are documents instead of the required videos.

The problem is that—for the previous query "videos of formula one"—there is a need to switch between different tabs (Web, Video, among others) in order to obtain the required information. One of the big challenges is how to improve the way the content is being displayed. Although there are different contents related to the query (e.g. Video, Web pages, and Structured Data), the top one structured information is displayed on the right and the top ten documents are listed on the left. These patterns often repeat between semantic

<sup>2</sup> <https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content>

search engines, but: (1) Why not display videos, images and other content related to the query? and; (2) Why—instead of displaying the top one structured data and top ten web pages—search engines do not display the top ten results, independently of the data type?

We propose that semantic search interfaces should have a heterogeneous data-face. Figure 1(a) shows a semantic search interface displaying heterogeneous results, an example of the pattern ② HD. The given example also implements a better version of Actionable Results than the one used by Google in Figure 3. Different from the previous models, it can promote a better interaction experience to users because all query related contents are displayed in a single canvas where it can also be activated.

## 2.4 Dive in-place

Dive in-place is an extension of the pattern Actionable Results. The idea behind this concept is that the interface should be self-contained. That is, the user should be allowed to explore the displayed information in-place. Dive in-place is not the same as Faceted Search. Faceted Search necessarily involves a change of the elements in the view and is also known as Faceted Navigation or Faceted Browsing, which involves the application of filters. Dive in-place is followed close by the design principle of Cooper et al. [1] that emphasizes as a good design principle the reduction of *places to go*. According to Cooper, reducing the number of screens, pages, and modes on Web sites increases people's ability to stay oriented.

Dive in-place involves the addition of new elements, it allows a more detailed version of the content without leaving the view. Some applications implement this pattern as a modal window or as a *more* button, where a detailed content is revealed to the user. However, a good example of Dive in-place is the Google's *Image* tab which allows users to interact with the images by giving an expanded version in-place. Different from the *Image* tab, a bad example is the *Map* tab. When a user requests the *Map* tab of the current search, the content is displayed in a new page. A good behavior is to open an extended view in-place in the same canvas in which the user can interact with the content. Search engines, usually force users to open the content in different windows in order to find the information needed.

By switching back and forth in order to find the information, the exploration can become tedious. Dive in-place is a good pattern to avoid such an experience. Figure 1(b) demonstrates the pattern Dive in-place in action. In the given interface, an extended view of the page content is shown enabling further exploration.

## 3 CONCLUSION AND FUTURE WORK

In this work, we presented four patterns for semantic search interface: (i) Poli-Communicative, (ii) Discrete Display, (iii) Heterogeneous Data-face and (iv) Dive in-place. As future work, we plan to do an extensible and detailed evaluation as well literature review. We see this work as the first step towards the enhancement of semantic search user interfaces.

## 4 ACKNOWLEDGMENTS

This work was partly supported by a grant from the German Research Foundation (DFG) for the project *Professorial Career Patterns of the Early Modern History: Development of a scientific method for research on online available and distributed research databases of academic history* under the grant agreement No GL 225/9-1, by CNPq under the program *Ciências Sem Fronteiras* process 200527/2012-6.

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